Product Design using Value Engineering

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Lecture - 07
Problem Identification and VEJP

Namaskar Friends! Welcome to session 7 of our course on Product Design using the Value Engineering aspects. So, title of the course as you are well aware by now is product design using value engineering. So, just to have a brief review of what we have covered till date. We have covered the basic aspects of product design process, why new product design is essential for the good economic health, financial health of any organization; we have already covered. We have seen the product life cycle.

We have also seen that always new product development will fuel economic growth of any organization. And how value engineering can help in the growth of an organization that is the basic idea with which we have conceptualized this course. So, basic aspects of product design; if you remember we have already covered in another courses. We have already done a 10 hour course on product design and development with the best wishes of all of you, it has been rerun two or three times.

So, we are not here, to discuss what is product design. We are here to discuss how the concepts of value engineering can help us to further argument our process of product design. So, what is value engineering, and how it can help us to improve our designing process that is the basic aspect with which we have conceptualized this course.

In the last two sessions; if you remember, we have seen cost cutting the difference between value engineering and cost cutting. Many of us gets confused that what is the difference. We here also we are focusing on the functions to be achieved by the product, we are focusing on cost. Similarly, in cost cutting also our focus is to reduce the cost of the product.

So, what is a difference? So, difference we have already highlighted in one of our previous sessions. Also if you remember, we have seen that creativity is the key word in value engineering. If we are creative, if we can come up with number of alternatives for solving a single problem, we have a choice of plenty; we have a problem of plenty. I

must say that we have so many solutions which can help us to achieve our target. So, creativity is a key word in value engineering.

So, today we will see we will try a creativity is a very subjective area, we consider because we can be creative, we can definitely extract our creative juices to find number of solutions to a given problem. So, how to now systematically create an ecosystem through which we can of or a funnel through which we can make our ideas into reality.

So, creativity will gave give us n number of alternatives, but among those alternatives we will have to choose the best alternative which can help us to achieve our target and our target can be product design, our target can be a process, our target can be a service that we can offer to the customers who are in need or there is a requirement in the society. So, basically creativity will help us to generate ideas and now these ideas have to pass through a scrutiny process or the stages which will help them to be further improve into a tangible product or a service.

So, in today's session our target is to look at the problem identification and the value engineering job plan. Now why we have considered creativity? Today again creativity is going to come into picture. We will see that where the creativity fits in the overall product development process. So, we have to be creative creativity. We have already seen is an essential ingredient of value engineering.

Now today, we will try to understand in the overall structure, overall step by step procedure of value engineering job plan where do creativity fits in. And on your screen, you can see that our target today is problem identification. There are standard methods of problem identification. So, we will not go into detail, but majorly our target today will be to learn more about the Value Engineering Job Plan which is already written that is VEJP.

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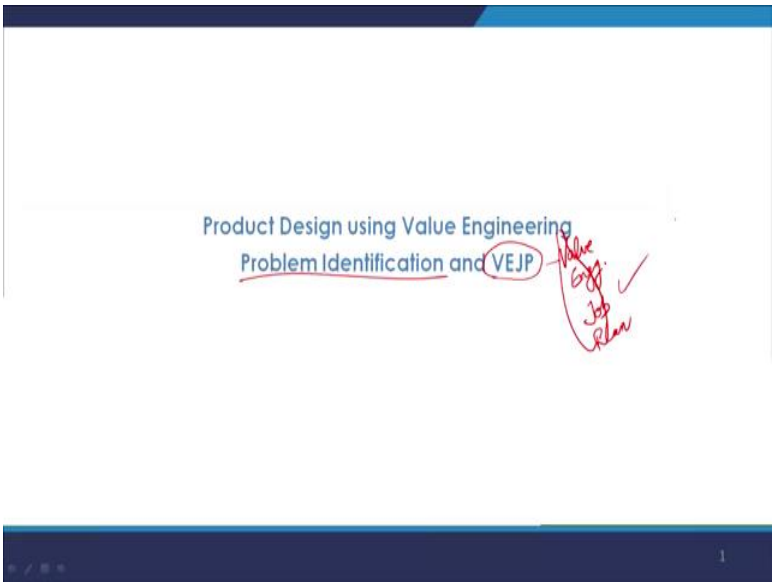

So, our target is value engineering job plan. So, let us quickly go to the problem identification stage. So, as all of you know defining a problem is the most important step and normally, we use the 5 Ws approach to identify the problem.

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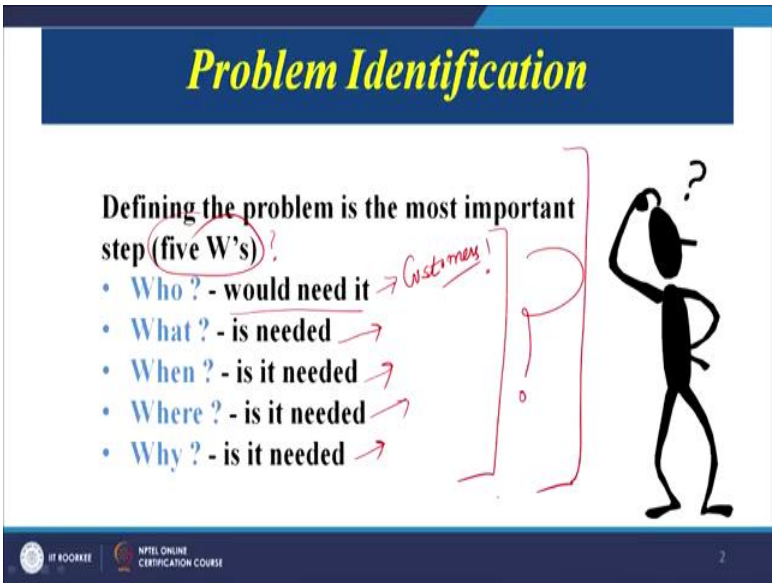

Now, we first focus on the customers that who would need our product. Suppose we have an idea, we have to focus on the customer that the person whose going to use our product, what is needed another question that will help us. Suppose, there is a need in the society, there is a specific product that is required by the society.

For example if we see the online platforms for booking, the cars or the taxis, so, there was a requirement and some company identified that requirement and came up with a product through which over your mobile phone, you can book a taxi wherever, you are your location is tracked down and through that location a taxi will come to you the even the rates are flashed on your mobile phone.

So, that is a product; there was a need in the society. A company identified that need and then that need was satisfied in the form of an app that you can download on your mobile phone and use it. So, that is what question is what is needed; there was a need and that was satisfied by a tangible product.

When it is needed? Maybe sometimes, we have a question that when a particular product is required. Where it is needed, location? Sometimes a product may be specifically required in a specific set of location or a specific set of country or a specific set of states or a specific set of maybe sometimes if we have to design a product where we are going to generate the electricity through the wind so, there we have to identify that this type of setup windmills or wind farms can only be developed where we have adequacy of the wind; the wind speeds are adequate.

So, the location sometimes will help us to identify our product why it is needed. So, sometimes we may always question that why this product is needed. If we are able to find out a suitable answer, why it is needed? We will get an idea about the product that what product can help us to answer this question that why it is needed.

So, normally I must say that there is a questioning technique that will help us to identify our problem; what is required, when it is required, where it is required, why it is required, for whom it is required. So, when we start questioning each and everything, we will definitely generate ideas through our creativity which we have already seen.

Now, if we see why this console is required, I am able to mark on this console. It gives a better explanation to the learners, they try to understand when I highlight certain points on the screen. So, therefore, why it is required there is a purpose behind that. Why the camera is recording the session? There is a purpose behind that.

So, that is basically the questioning technique which will help us to further fine tune our product. So, this is the first stage that is of problem identification. It is a general

approach of problem identification. But when you specifically focus on value engineering, there may be a number of products which are already existing. For example, this point is already existing it is acting as a slide changer also. So, this is already existing sometimes I may feel like that there can be a better product than this.

What can be the better product than this? Then, there the creative juices have to be taken into account, and then we have to see that what can help us to achieve this function of changing the slides in a much easier and better manner. So, that is basically the concept. So, from value engineering point of view, we will focus on the products which are already in place. We will try to improvise; we will try to improve them, we will try to find out better alternatives for the products. How we will be able to focus that we will see in the subsequent slides today.

But the first thing is identification. So, which products we will identify? We will identify the products on which no work or maybe the product was designed 20 years back. No work has been done on redesigning that product, no process has been changed for fabricating that product, no material has been changed with which the product is fabricated. So, we know that this product has not changed over the last 20 years. Why not to focus our energy on this product? Still the product is required in the market; there is a need of this product, but we can further improve this product.

So, we will try to change the materials, we will try to change the process by which, we are making, we will try to change. The third thing is the design. Fourth thing is that we may like to completely eliminate the product, and we may try to come up with a completely new solution to that product.

For example, earlier we used to have cassette players, then we came with the compact discs; today we use a USB drive to listen to the music. So, if you see the devices that we are using for listening to the music have changed over a period of time and with the technological advancement things have changed. So, it is not that we have to change that the cassette only that we can now change the material of the cassette, we can change the ribbon of the cassette. No, we can completely eliminate that device and come up with a completely new product which is satisfying our function, our function is to store music and then use that device to listen or to create music.

So, therefore, our target as you can understand is not only focused on the change in the material or change in the process. Our focus, is change in the design change the complete product, but the essential function for which the product is designed must not change. So, that is the basic idea. So, the function has to be achieved. So, that is the basic you can say understanding about identifying the problem. So, the product which has not been changed for so many years, we can focus on that.

Second thing can be that where we find that there is a lot of potential of change in this product. Many times we will calculate a value worth that what is the value gap between the existing design and the final function that we want to achieve. So, there will be some value associated with the final function, there will be some value that can be related to the existing product. So, we have a value for the existing product, we have a value of the product that we can envisage or the function. So, there is a gap between the two. So, the products for which the value gap is large, we can say that only this function has to be achieved.

Why we must spend so much money on this particular product? For this function, we can come up with a new product. So, the new product can give us extremely high value, high means that the cost is low, the function is being achieved satisfactorily.

So, the products for which the value gap is large, we can focus on those products. So, therefore, apart from these 5 Ws, we can also use our common sense to identify the areas, the products, the services which need a revamp, which need a redesign, which need a relook and once we relook on these products definitely, we can try to improve these products. But once we are able to identify a specific area on which we want to focus, then we need to have a systematic value engineering job plan. Systematically step by step, we have to move forward and then, we will definitely be able to come up with a improvised product.

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Now, what are the steps in defining the problem? As we have already seen, we can identify the background issues as I have already told that we have to focus on the historical perspective of the product. Just now, I took an example. There is no change in the product for the last 20 years. So, we have to focus on those issues that this product must be relook, this product must be redesigned, and this product must be revamped.

Then we have to see that what are the resources available with us, what are our constraints, do we have the adequate technological advancements available with us to relook at our product or to change the product or to redesign the product. There can be certain constraints. The constraints can be in terms of time, may not be available cost of redesigning.

Some time we are we are able to redesign, but the infrastructural support is required we need to change the machines, we need to change the layout, we need to change the technology. So, under all these constraints, can we still think of redesigning our product? So, we have to take it that thing into account.

Then, what is the final objective of the decision maker? We have constraints, we have a set of resources, we decide that we need to change, but finally, we have to see, what is the objective. Now, the objective can be that we want to completely do away with our existing design and we want to come up with a completely new design which is different

from the existing product that we are offering. So, that is the final decision that objective with which we will go forward.

Then we have to look that what the customers want because if the customers are satisfied, they are happy with our existing product, and there is no competition in the market. We are able to hold on to our market share, we may be a bit reluctant to change because our product is doing well, but in case of a competitive business environment. There are so many other companies coming up offering better products, offering better solutions to the problems of the customer then we will definitely like to have a relook at our product.

So, we need to understand the buyer behaviour also that how the buyer is satisfied or whether the buyer is satisfied, whether the customer is satisfied with our product or not. Then we have to sometimes in the legal frameworks or rules keep on changing and suppose there we foresee that some particular government legislation is going to come maybe in the next 3 years or 5 years time. Today only, we will start to think of a advanced version of our product which comply with the legal requirements. We can see that these days, there is lot of focus on the ecology on the environment.

So, suppose today we are manufacturing a product, there is no legal complication or no legal requirement to satisfy a particular set of norms, but maybe we envisage that this is going to come. Maybe in the next 5 year, definitely we will start to look at our product critically analyze the product that whether it is environment friendly. If not, how we can make our product environment friendly, what are the changes required in the materials, in the design, in the processing techniques. So, that if there is a legislation focusing on specific things related to the environment, we are able to comply with those legislation.

So, the legal environment is also equally important, then the economic environment also as i have already discussed that if the product is doing well, there is no problem with the product. The customers are still buying it, we are able to hold our market share. Sometimes, the company may feel complete sense that there is no need to change the product.

But if we see in the product life cycle that the sales are declining continuously, we need to relook at our product, we need to look at the features that we are offering at a competitive cost. Sometimes, we may have to look at our cost structure also that how we

can change our cost structure. So, that we become competitive in the market sometimes we may have to compromise on our profit margins also in order to be competitive. So, there are a number of approaches that we may like to adopt in order to have or in order to offer a good value product or a high value product to the customer.

So, the economic environment also has to be taken into account because once the sales are declining; obviously, it is an important step in defining the problem. We know now the sales are coming down, we need to have a real look at our product. Then marketing and technological skills of the firm is also very important aspects when we are defining our problem, why? Because sometimes our marketing teams are so well equipped, our technology skill; skills are so well known or so well established that whatever product, we come we are sure that our product is going to be successful in the market. So, we need not worry.

So, if we are technically competent, our sales teams have the potential to sell the product or the technological product that the team is developing. Then in that case, we may not be that worried, but in a technically challenging environment. We are so many companies have the technical competence as well as the competitive products are also in the market, we need to look at defining our problem. We need to find out that what can be our unique selling point, what value we must offer to our customer at a competitive price. So, that our product is successful.

So, when we are defining a problem or when we are selecting a problem, all these parameters will come into picture; the legal, the environment, the financial, the technological, the buyer's behaviour, the main objective that we are setting. So, things are more abstract here. We cannot quantify all these things in the form of an equation which can help us to solve, and give us an answer that this is now the problem which you must tackle.

But if we focus on all these aspects in totality, we have a holistic view of all these parameters. We will be able to come up with a challenging problem which may be addressed in order to be successful in the market. So, you can say an overall summary of the parameters that we must consider when, we are trying to identify a problem or a product on which we must focus our efforts.

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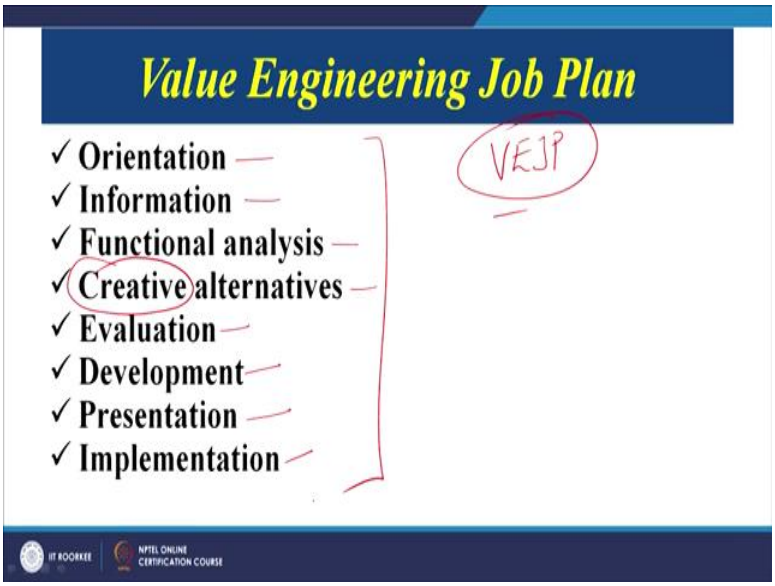

Now, this is a value engineering job plan. A systematic approach of applying the principles of value engineering, and the various steps are mentioned on the screen. One by one we can see. The orientation, information, functional analysis, creative; again the word creativity is coming into picture. I have already discussed in the beginning of today's session; evaluation, development, presentation and implementation. So, one by one, we will try to see these points or see these steps that what we need to look at during each one of these.

So, first is the orientation. We were seeing in the beginning of today's session, the steps in identifying a problem. So, the in the orientation phase, our first thing is identify the issues to be addressed.

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Now, issues can be related to the design of the product, issues can be related to the materials that we are using to make our product. These can be related to the sales, these can be related, and our issues can be related to the process that we are using to make our product. So, we have to identify the issues.

Then, once we have identified, we need to prioritize sometimes it may so happened that we are not able to address all the issues. So, we have to prioritize that which of the issues need the first attention, which are the issues need to be addressed first, then maybe at a later stage; we may focus on the other issues also.

So, then second step is we need to prioritize the issues during the orientation phase. Now once we have prioritized; for example, our main challenge is coming from the design. So, we say that most of the products are coming back because of certain design problems. Although, we can focus on materials as well as processes also, but our first challenge is suppose the design.

So, now we prioritize that our first challenge is design. Now for design, we will draft the scope and objective that our focus can be now, we have to come up with a design which is more cost effective; maybe one example. We have to come up with a design which is more efficient, we have to come up with the design which is easy to service, we have to come up with a design which requires very low maintenance or we have to come up with a design with zero maintenance. So, we have to focus and prioritize.

So, we will draft the scope, and the objectives for our design. So, this is a third point. During the orientation phase we have identified the issues, we have prioritized the issues, and then, we go for crisply defining that what we actually want to do. Then once we say for example, that we want to make our design maintenance free.

So, for maintenance free, what are the evaluation of factors that we are going to check whether the design has become maintenance free or not. So, we have to establish those evaluation factors based on which we will check our design or we will check cover new design. Our old design is having problems with maintenance. We have decided that we are going to change the design. We are going to make the design our objective is maintenance free. Now for maintenance free, what are the factors that we must take into account when we are checking our new design?

Once, we are able to focus on those factors, then we have to make a team; determine the study team who are going to be the people who are going to be working on this project of renovating the design or making a new design or proposing a new design of a product which is maintenance free. Then, we will collect the data which is a standard approach our product is already existing. It has some maintenance issues, we will collect the data what are these maintenance issues, why these maintenance issues are coming up, what are the competitors product, what is their maintenance strategy, how they have designed the product, historically how our product has performed. So, all the data will be collected and then we will prepare for the value study.

So, now in this complete phase of orientation, we have identified the problem, we have collected the data related to the problem, we have made a team which is responsible for carrying out this study, we have clearly defined the objectives of the study. So, this our first stage is over you know in the orientation phase.

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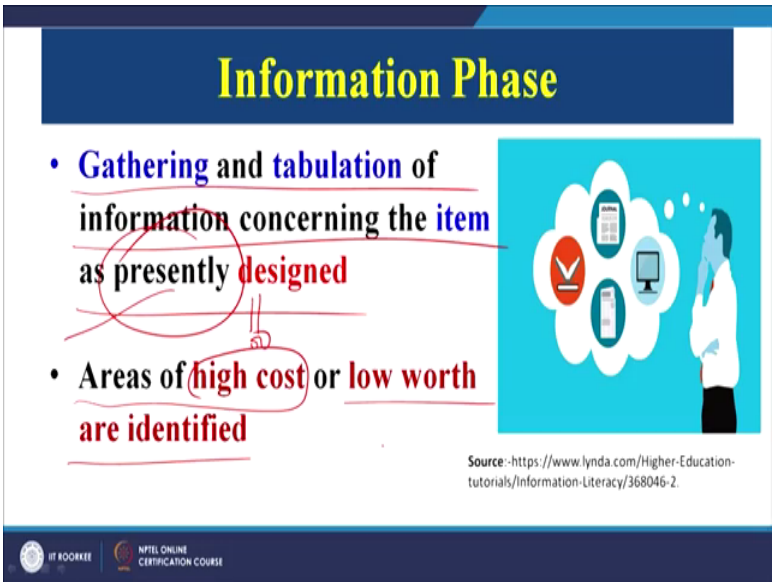

Then the second is the information phase. This is most important gathering and tabulation of the information concerning the item as presently designed; most important part is the presently designed. So, our current design we are going to calculate all possible types of information.

So, that we are able to make an informed choice of the alternatives which can help us to achieve our target. Then, we can focus on the areas of high cost, low worth are identified. In our example, we will focus on the areas which have led to a lot of maintenance or lot of failures.

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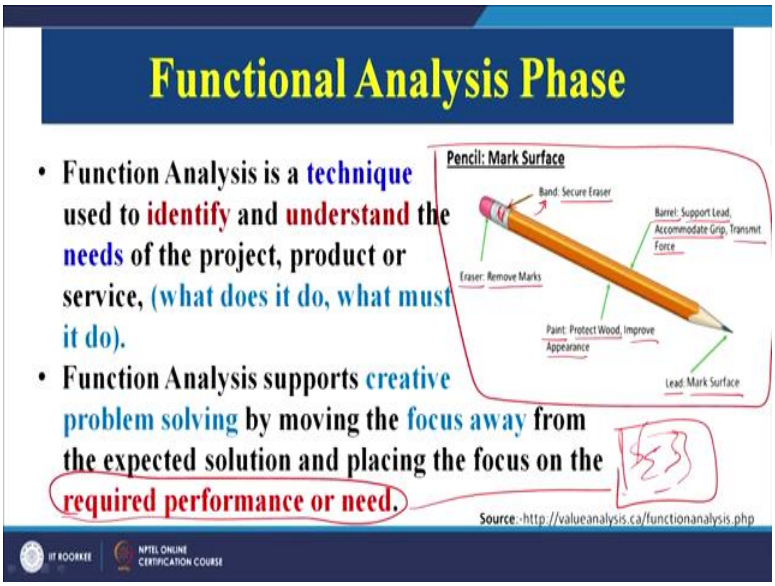

Then the third stage is a functional analysis phase. Example is taken here, a pencil and if you can clearly see each particular element or each particular part or each particular sub component of the pencil has been functionally defined in two words only. But this band green color, this is shown here the silver band; secure eraser two words only. Eraser, what is the function? Remove marks, paint, what is the function? Protect wood, improve appearance, lead, what is the purpose, make surface? Barrel. What is the function? Support lead, accommodate grip, and transmit force.

So, we can see that each of the component of the pencil or each part of the pencil has been clearly defined functionally. So, the function of band is to secure eraser. So, we have a verb and a noun definition for each and every function being achieved by each and every part of the pencil.

So, functional analysis is a technique used to identify and understand the needs of the project, product or service. What does it do? What must it do? So, we will try to see that why somebody must use this pencil; what is the purpose, what is the basic function of a pencil then, functional analysis supports creative problem solving by moving the focus away from the expected solution and placing the focus on the required performance or need.

Now, the required performance or need is to make some marks on a piece of paper. This is a required performance. But if you ask somebody I want to make these marks, prompt

reply will come use a pencil, but in case of value engineering, the focus will be how to make these marks, why do we need to make these marks, what can be the best way of making these marks. We will not focus directly on the solution which is a pencil; we will focus on the function or the performance that is required. So, or the way our focus will be on the need the need is to make these marks on a piece of paper. So, the need is the focus area here, not the expected solution; expected solution is a pencil, a pencil can make these marks.

So, third stage is the functional analysis. First stage is orientation, second stage is information gathering, third stage is functional analysis, and this is the most important stage functional analysis, we have to identify the basic function, the secondary function, the tertiary function of the product. Once that functional analysis is carried out, then the creative alternatives have to be decided, they have to be found out.

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So, here there is an opportunity for the team to produce alternate means already in red colour, it is written, alternate means of performing the functions associated with the product service or the project.

So, what we have to do? This alternate means have to be associated with the functions, the functions for which the product is required. For example, the pencil we can say the basic function of the pencil can be to make marks on the paper. So, that is a basic function.

The goal is to generate as many ideas as many ideas as possible in a short period of time. This can be accomplished through function based brainstorming. So, there is a problem at hand, we have to satisfy a particular function, and what can be the alternatives for satisfying that function that has to be creatively established. We will use the creativity of the individuals, we will keep on noting down the solutions and then, we will scrutinize those solutions to come up to the best solution or to come up with the best solution.

So, all the team's members including the stakeholders, designers, participate in the creative brainstorming session. So, first in the previous slide, we have seen functional analysis. We will try to establish the function of each and every component of the product. For example, this camera is recording this session. There are so many sub components of this camera. So, we will try to establish, the basic function of each and every component. Some of the components may be having interacting functions also that also we will cover in the subsequent session.

So, we will try to establish the function of each and every component and in the creativity phase, we will try to make a list of alternatives which can help us to achieve these functions. Maybe currently it may be having hundred different components, but when we do the value analysis of this product that is a camera. We may come up with only twenty to 25 sub parts which can be assembled together, but they were able to perform the function which is being accomplished by a 100 component assembly.

So, from 100 components, we can come down to 25 components why? Because now, we have tried to look at the functions of each and every component. We will try to bring some functions together. We will try to combine certain functions, we will try to eliminate certain add redundant functions, and we will try to do a multifunctional product design. So, that now, the assembly requirement becomes less; the assembly operations become less, tedious the cost of assembly can also be reduced.

So, first two stage is functional analysis, second now we have seen the creative alternatives. Once you have so many ideas, you are very happy.

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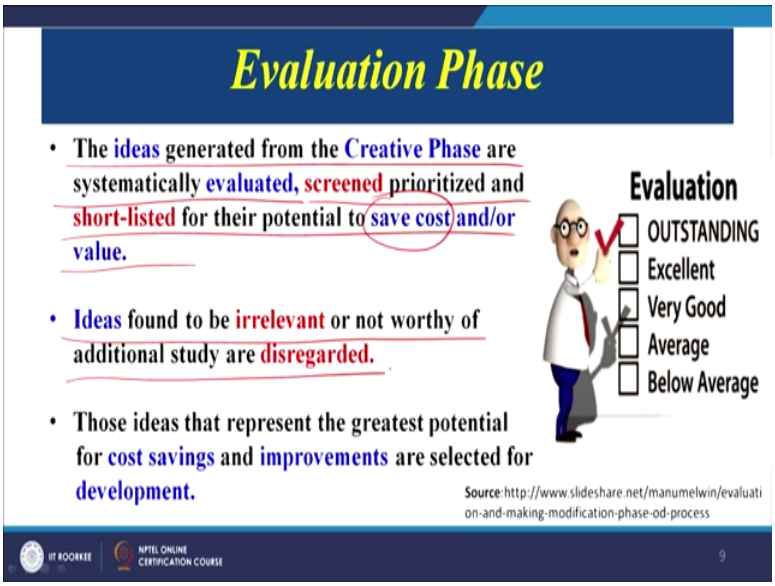

Now, you have to evaluate those ideas. The ideas generated from the creative phase are systematically evaluated; they are screened, prioritized and shortlisted for their potential to save cost and or value. So, we have to add the value. We have to save the costs. So, we will screen the ideas, we will subject these ideas to a lot of scrutiny, and we will try to find out which idea is better.

Ideas found to be irrelevant or not worthy of additional study are disregarded. Those ideas that represent the greatest potential of cost savings and improvements are selected for development. So, I think the language is very clear. We will screen the ideas with less potential or disregarded ideas with huge cost saving potentials as well as value improvement are selected for further analysis.

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Now, the development phase. The objective of the development phase is to develop. We have an idea, now we have to develop it into a prototype. So, develop the idea in sufficient detail to be compared to the originally proposed solution. So, now, we will develop this idea. We have already defined what we want to do.

Now among all those ideas, we have shortlisted few ideas which we will try to develop and try to compare them with the objective with which we have started or compare this idea or the product coming out of this idea with the product which is already existing that we want to improve. So, it enables the proposals to be developed systematically and evaluated against to the proposed solution. So, we will try to develop our idea in line with the proposed solution.

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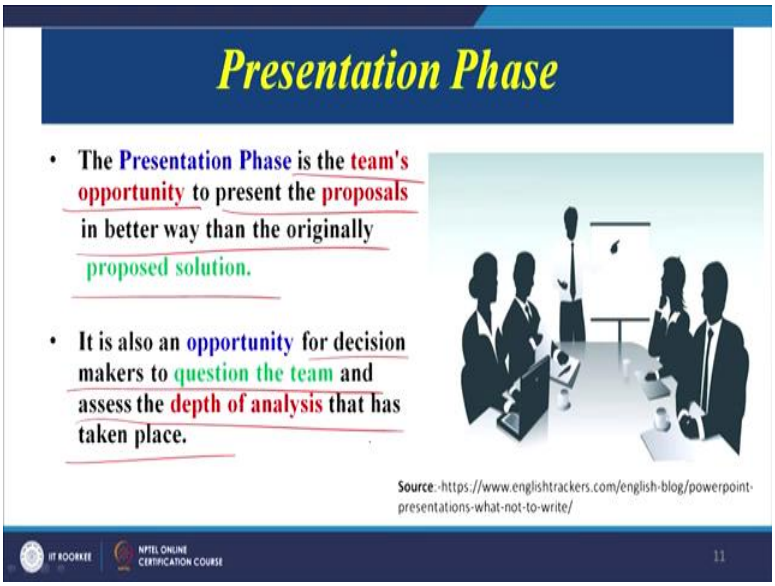

Now, the presentation phase; once our idea is developed in the form of a prototype or in the form of a fully functional product, we will make a presentation. The presentation phase is a team's opportunity to present the proposals in a better way than the originally proposed solution. It is also an opportunity for decision makers to question the team and assess the depth of the analysis that has taken place. So, there may be one proposed solution.

Now, we have done a value analysis of that solution, we may come up with a better solution. So, a better solution needs to be presented to the team and then, there can be critical examination of our idea that developed product that we are proposing. And once the critical examination takes place, we will be able to further improve the technical merit of our idea. So, that is the presentation phase.

Once the presentation phase is over, we are product has passed the scrutiny; we will go to the implementation plan. So, we will develop an implementation plan, execute the plan, and monitor the plan to completion.

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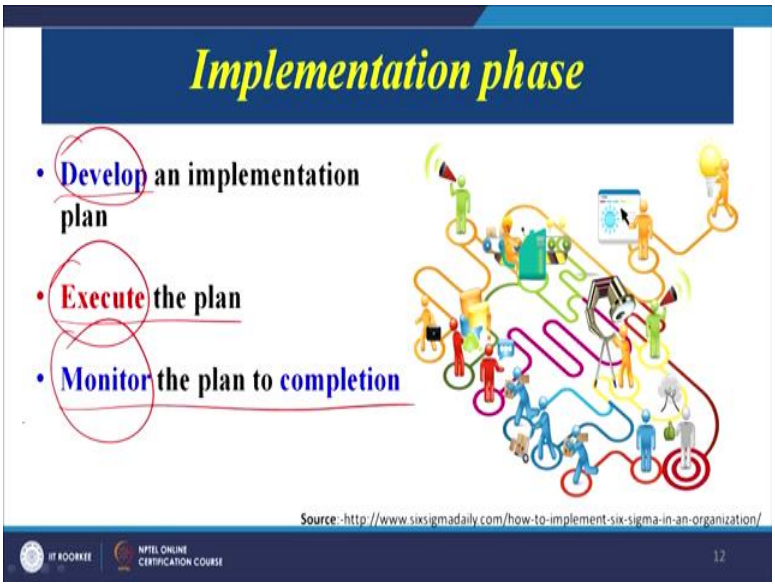

So, there are three important words, develop an implementation plan, execute the plan and monitor the plan. So, once we are coming up with a new product, our product has passed the last stage of scrutiny. During the presentation, we will then try to develop the implementation plan that is how much quantity of the product we are going to make, how we are going to promote the product in the market, what marketing strategy we need to follow. So, all that will come in the implementation plan.

And once our implementation plan is ready, we will go for a full scale launch of our revised or are modified or updated or revamped product; we will launch it in the market. And once the product has been launched, we will try to monitor the plan, we will try to see that the sales that we have thought whether the product is able to achieve those kind of sales, the example that we have taken maintenance free design.

So, whether the design that we have been able to make is really maintenance free, are there still some maintenance issues with our product design. If there are no maintenance issues, we can be happy. We can complement ourselves that yes, we have use a systematic value engineering job plan and finally, we have been able to launch a product in the market which is maintenance free.

So, but the job does not end there. We have seen that we have prioritized. There were problems related to the design related to the materials, related to the processes. We have only focused on one aspect that is a design. Our team will then again, start focusing on

the materials as well as the processes that are being used for making the product. So, it is a continuous process. So, whatever, we have seen are the steps involved in a value engineering job plan. So, and if we follow these steps systematically, we will be able to solve any problem related to the value engineering aspects.

So, with this we conclude the today's session. We will try to focus on other aspects, other higher order aspects of value engineering in our next session.

Thank you.